BISCHOFF RESERVOIR

2004 Fish Management Report

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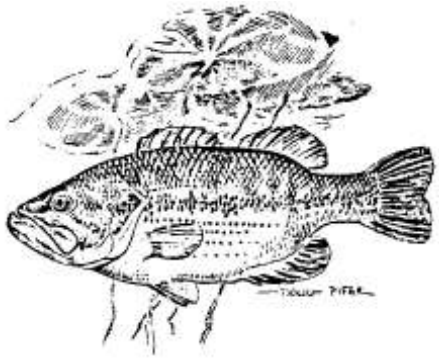

FISHERIES SECTION
INDIANA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FISH AND WILDLIFE
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Indianapolis, Indiana 46201

2005

BISCHOFF RESERVOIR

Ripley County

Fish Management Report
2004

INTRODUCTION

Bischoff Reservoir (also known locally as Batesville Reservoir or Morris Reservoir) is a 190-acre impoundment located approximately one mile southwest of the small town of Morris in southeastern Indiana. An Indiana Department of Natural Resources (IDNR) public access site with a parking lot and concrete boat ramp is present. Electric trolling motors and gasoline outboards (up to 6 horsepower) can be used on the lake.

The lake was constructed on Bobs Creek in 1960. It is owned by the city of Batesville and managed by the Batesville Water and Gas Utility as a water supply reservoir. Approximately 1,200 acre-feet of water (79% of the lake's volume) are used annually by the utility to satisfy customer needs. Since the lake is a water supply, the number of techniques available to manage the fisheries is limited.

Bischoff Reservoir is one of the few lakes in southern Indiana where the standing crop of fish has been measured. The lake was drained by the utility in the fall of 1966 to improve water quality by removal of rough fish. As the lake drained, IDNR personnel measured and weighed all the fish. Results revealed the standing crop of fish in Bischoff Reservoir was 300 pounds per acre (Barry 1967).

The lake was restocked early in 1967 with largemouth bass, redear sunfish, channel catfish, and white catfish (Ameiurus catus). Regular stockings of channel catfish were started in 1977 to maintain the channel catfish population, which was not expected to sustain itself through natural reproduction. Prior to this survey, 43,257 catfish had been supplementally stocked by the IDNR's Division of Fish and Wildlife (DFW) from 1977 through 2003 (Table 1).

Gizzard shad, a species that has the potential to ruin sport fisheries in impoundments, had not been collected during any surveys at Bischoff before 1993. In the 1993 survey, however, gizzard shad was found to be the dominant species by number and by weight. This survey was conducted to evaluate changes in the fish populations since the last survey in 1993.

Table 1. Supplemental stocking record by IDNR for channel catfish in Bischoff Reservoir from 1977 through 2003.

Number	Average Length	Length Range	Stocking Date
3,318	---	4.0-13.5	June 1977
4,985	6.3	3.6-14.5	November 1980
5,000	8.1	6.2-10.6	October 1984
5,000	8.4	4.2-12.6	October 1987
5,000	8.2	4.6-11.8	October 1990
4,750	8.9	4.6-13.2	October 1993
1,657	10.8	6.2-15.4	October 1994
1,387	8.0	2.0-14.0	October 1994
3,040	8.2	4.8-11.6	October 1996
3,040	9.7	6.5-12.9	November 1998
3,040	8.2	2.8-13.6	November 2000
3,040	8.6	5.4-11.8	October 2002
Total= 43,257			

METHODS

This survey was conducted June 14-16, 2004, as part of DFW Work Plan 202478 that covers management of fish populations in impoundments. Some physical and chemical characteristics of the water were measured in the deepest area of the lake near the principal spillway. Submersed aquatic vegetation was sampled on August 11, 2004 using guidelines written by Pearson (2004). Vegetation was identified on site or later in the lab. Survey data were collected only in the main portion of the lake, which lies west of the culvert on County Road 450 East.

Fish were collected by DC-electrofishing the shoreline at night with two dippers for 0.50 hour. Two trap nets and four experimental-mesh gill nets were also fished overnight. A global positioning system (GPS) device, GARMIN GPSmap 76, was used to record the location of the limnological data collection site, fish collection sites, and aquatic vegetation sample sites.

All fish collected were measured to the nearest 0.1 inch in total length. Average weights for fish by half-inch groups for Fish Management District 8 were used to estimate the weight of bluegill, largemouth bass, redear sunfish, white crappie, black crappie, and hybrid sunfish within the sample. Other fishes were weighed in the field to the nearest 0.01 pound. Fish scale samples were taken from selected species for age and growth analysis. Electrofishing catch rates include all age groups of fish unless stated otherwise. Proportional stock density (PSD) values were calculated using fish caught by electrofishing.

RESULTS AND DISCUSSION

The reservoir was at normal pool. Sunlight penetration into the grayish-green water, as measured with a secchi disk, was 2.6 feet. As is typical for southern Indiana impoundments in the summer time, Bischoff Reservoir was thermally stratified into warm and cold layers. Dissolved oxygen concentrations were not adequate for fish survival below 8 feet. This stratified and anoxic condition is corrected each year during fall turnover when the water in the lake is mixed by the wind and falling temperatures. Soil and nutrients carried into Bischoff Reservoir by runoff from its 3,000-acre watershed has made it very eutrophic since it was built 45 years ago.

Submersed vegetation was found to a depth of 4.5 feet at some places along the shoreline. Eurasian watermilfoil (an exotic) dominated the population, but brittle naiad and southern naiad were found frequently throughout the lake. Filamentous algae, coontail, and curly-leaf pondweed (an exotic) were also present in the lake. Submersed vegetation does not appear to present a problem for the fishery in Bischoff at this time.

A total of 1,183 fish, representing 13 species and naturally occurring hybrid sunfish, was collected during this survey. Total weight of the fish sample was approximately 368 pounds. Species collected in past surveys, but not in this survey, include green sunfish and white sucker.

Bluegill ranked first by number (50%) and second by weight (23%) in the survey sample. They ranged in length from 2.2 to 8.2 inches, averaging 5.7 inches. Bluegill appear to be much more abundant now than in 1993 when they ranked third by number behind gizzard shad and white crappie (Lehman 1995). Compared to 1993, the electrofishing catch rate for bluegill has increased by 421%.

Bluegill growth, however, has decreased slightly from 1993 to 2004. For this survey, back-calculated lengths indicate bluegills reach 6 inches (i.e. quality size) during their fourth year of growth (Figure 1), which is comparable to 1993 and greater than the average for southeastern Indiana. Of the 596 bluegill in this sample, 55% were 6 inches or longer compared to 67% in 1993 (adapted from Lehman 1995). Over half of all bluegill in the sample were collected by two trap-net lifts.

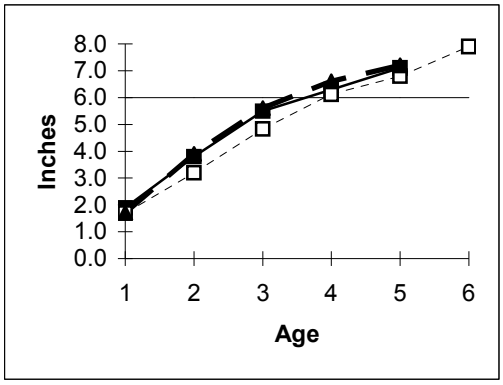

Figure 1. Bischoff bluegill growth from 2004 survey (solid line) compared to 1993 survey (dashed line) and to average bluegill growth observed in Fish Management District 8 impoundments (dotted line).

Balanced fisheries exhibit bluegill PSD values that range from 20 to 60 (Anderson and Neumann 1996). The PSD for Bischoff bluegill is 28, which is within the range, but a 58% decrease from the 1993 PSD value of 67, which was above the desired range. The decline is due to the presence of many more 3 to 6-inch bluegill now than in 1993.

The Bluegill Fishing Potential Index (BFPI) is an objective rating system that was developed in Indiana to assess bluegill fishing in lakes and ponds (Ball and Tousignant 1996). Out of a possible 40 points in the index, the current bluegill fishery scored 15 points, which is in the "fair" category (Table 2). Less than good growth and the lack of bluegill over 8 inches continue to play a major role in the BFPI score in Bischoff Reservoir.

Table 2. Range of scores for each category in the bluegill fishing potential index.

POOR	MARGINAL	FAIR	GOOD	EXCELLENT
0 - 7.0	7.1 - 12.9	13.0 - 18.9	19.0 - 25.9	26.0 – 40.0

Gizzard shad ranked second by number (30%) and first by weight (27%) in the sample. They ranged in length from 6.7 to 13.2 inches, averaging 9.4 inches. Gizzard shad first appeared in DFW surveys at Bischoff Reservoir in 1993 and were the most abundant fish by number (66%) and by weight (52%) (Lehman 1995). Electrofishing catch rate declined 37% compared to 1993. For this survey, gizzard shad growth is comparable with the average for southeastern Indiana (Figure 2).

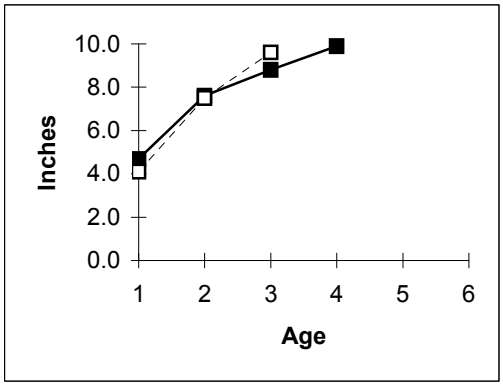

Figure 2. Bischoff gizzard shad growth from 2004 survey (solid line) compared to average gizzard shad growth observed in Fish Management District 8 impoundments (dotted line).

Largemouth bass ranked third by number (5%) and fourth by weight (15%) in the sample. They ranged in length from 1.5 to 19.1 inches, averaging 10.7 inches. The electrofishing catch rate, which increased 209%, indicate bass are more abundant now than in 1993. Bass growth is comparable to 1993 and the district average (Figure 3). Bischoff bass appear to reach the legal size limit of 14 inches during their sixth year of life, which is the average for southeastern Indiana. Twelve of 60 bass (20%) collected were legal size, representing ages 5-8.

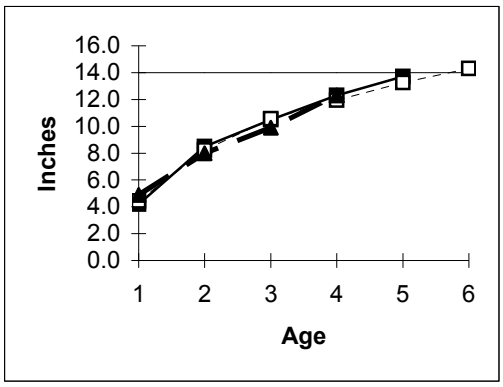

Figure 3. Bischoff largemouth bass growth from 2004 survey (solid line) compared to 1993 survey (dashed line) and to average largemouth bass growth observed in Fish Management District 8 impoundments (dotted line).

Balanced fisheries exhibit largemouth bass PSD values that range from 40 to 70 (Anderson and Neumann 1996). The PSD value for Bischoff bass is 48, which is within the range and a 234% increase from the 1993 value of 14, which was well below the desired range. More quality-size bass (≥12 inches) are present now than in 1993.

Redear sunfish ranked fourth by number (4%) and seventh by weight (3%) in the sample. They ranged in length from 4.4 to 8.0 inches, averaging 6.6 inches. Of 42 redear collected, 13 (31%) were 7 inches or longer (i.e. quality size). For this survey, redear sunfish growth is greater than the average for southeastern Indiana (Figure 4).

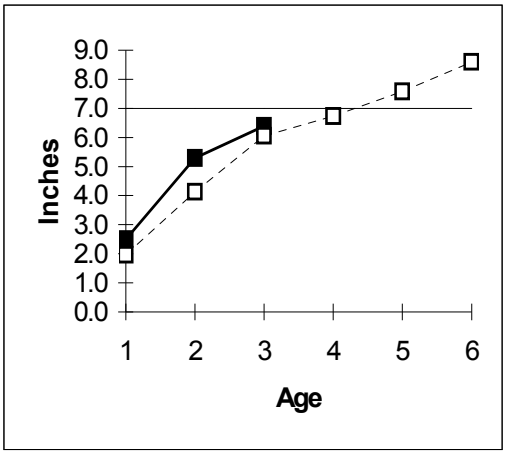

Figure 4. Bischoff redear sunfish growth from 2004 survey (solid line) compared to average redear sunfish growth observed in Fish Management District 8 impoundments (dotted line).

White crappie ranked fifth by number (2%) in the survey sample; they ranked second by number (12%) in the 1993 survey. For this survey, they ranged in length from 4.7 to 12.1 inches, averaging 7.5 inches. Of 27 white crappie collected, 11 (41%) were 8 inches or longer (i.e. quality size), which is an increase from 1993 when 6% of white crappie collected were 8 inches or longer (Lehman 1995). Although white crappie growth is less than the district average (Figure 5), white crappie are reaching 8 inches during their fourth year of growth, which is within the average for southeastern Indiana.

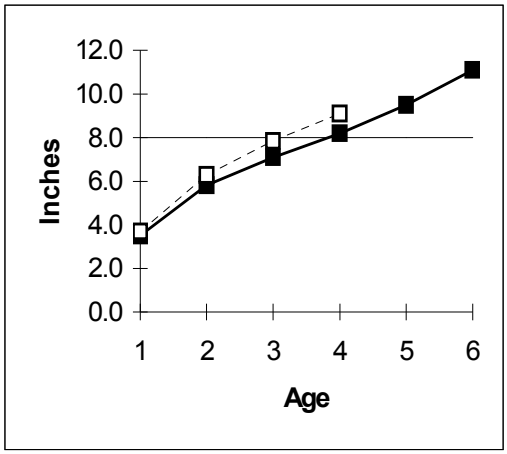

Figure 5. Bischoff white crappie growth from 2004 survey (solid line) compared to average white crappie growth observed in Fish Management District 8 impoundments (dotted line).

Black crappie ranked sixth by number (2%) in the survey sample; no black crappie were collected in the 1984 or 1993 survey. They ranged in length from 5.1 to 9.0 inches, averaging 7.3 inches. Of 26 black crappie collected, 4 (15%) were 8 inches or longer (i.e. quality size). Black crappie growth is comparable with the district average (Figure 6). For this survey, black crappie reach 8 inches during their fourth year of growth, which is the average for southeastern Indiana.

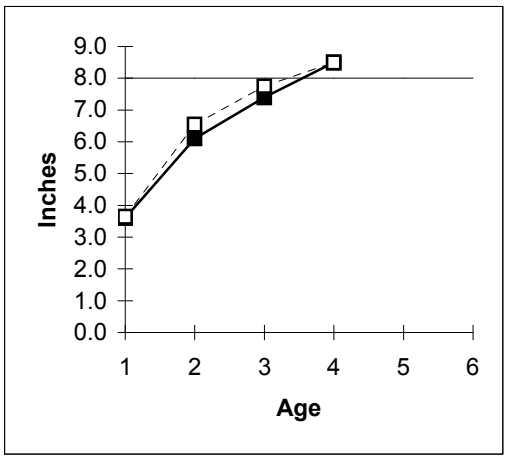

Figure 6. Bischoff black crappie growth from 2004 survey (solid line) compared to average black crappie growth observed in Fish Management District 8 impoundments (dotted line).

Twenty white catfish were collected. They ranged in length from 9.2 to 18.0 inches, averaging 13.5 inches. This species has maintained itself fairly well in Bischoff Reservoir for the past 37 years without the benefit of any supplemental stockings.

Seventeen channel catfish were also collected in the survey. They ranged in length from 11.2 to 19.5 inches, averaging 14.5 inches. Most of them were 12 inches or longer, which is considered a harvestable size by some anglers. Based on their lengths, they should represent some of the channel catfish stocked in 2000 and 2002 (Table 1). The low number of catfish collected in this survey would seem to indicate good harvest by anglers.

SUMMARY AND RECOMMENDATIONS

In this survey, bluegill relative abundance and electrofishing catch rate improved from the 1993 survey. Even though the PSD value of 28 is low in the desired range and the BFPI score of 15 is "fair," over half of all bluegill in the 2004 survey were six inches or longer, which means that bluegill continue to provide fishing opportunities. Redear sunfish, crappie, catfish, and other panfish also offer some fishing opportunities at Bischoff Reservoir at this time.

As in 1993, gizzard shad compose a significant portion of the Bischoff fish population. Although bluegill outnumbered shad in this survey, 30% of the resource by number is tied up in a species of little use to anglers. Small shad do provide food for fishes, such as bass and crappie, but shad will compete with other fish for zooplankton. A large population of shad can eat so many of the microscopic animals that only a few of the young bass and bluegill, which also eat those small animals, can survive. Another problem is that predatory pressure is diverted away from panfish and common carp where it is needed in Bischoff Reservoir to keep these species under control.

Largemouth bass growth is slightly above average, but the bass PSD has greatly improved from 1993. Twenty percent of all bass collected were legal size. As was also observed for bluegill, bass relative abundance and electrofishing catch rate improved from the 1993 survey. The 14-inch minimum size limit should remain in effect to prevent over-harvest of largemouth bass, for it is important to maintain a strong predator population at this time.

Bischoff Reservoir is scheduled to be surveyed from 2005 through 2009 under DFW Work Plan 204034, which is titled, "Gizzard shad experimental management strategies." The work plan objectives are:

1. Report on how the illegal introductions of gizzard shad have negatively affected sport fish populations and reduced fishing opportunities.
2. Determine the most effective way(s) to control excessive gizzard shad populations.

3. Determine how sport fish populations respond to various gizzard shad management techniques.

According to the work plan, Bischoff will be surveyed from early to mid-June each year. Only largemouth bass, bluegill, and gizzard shad will be collected. Bischoff will be used as an experimental control to determine natural fluctuations in shad populations.

Prior to this survey, 43,257 channel catfish had been supplementally stocked in Bischoff Reservoir by the DFW from 1977 through 2003. On October 19, 2004, 3,040 channel catfish (6–11 inches) were stocked. The DFW should continue to stock 3,040 channel catfish every two years as long as it is felt that channel catfish should be managed in this manner. Channel catfish should average at least 8 inches in length when stocked to reduce predation by bass. The next stocking is scheduled for the fall of 2006.

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Submitted by: Clinton R. Kowalik, Assistant Fisheries Biologist
Date: July 15, 2005

Approved by: Larry L. Lehman, Fisheries Biologist

Approved by: _____
Brian M. Schoenung, Fisheries Supervisor
Date: September 26, 2005

LAKE SURVEY REPORT

Type of Survey: [ ] Initial Survey [X] Re-Survey

Lake Name	County	Date of survey (Month, day, year)
Bischoff Reservoir	Ripley	June 14-16, 2004
Biologist's name		**Date of Approval (Month, day, year)**
Larry L. Lehman		September 26, 2005

LOCATION

Quadrangle Name	Range	Section
Batesville, IND. 1961. Photorevised 1980	12E	27, 28, 33, 34
Township	**Nearest Town**	
10N	Morris	

ACCESSIBILITY

State owned public access site	Privately owned public access site	Other access site
2-lane IDNR concrete ramp with parking		Lake owned by City of Batesville

Surface acres	Maximum depth	Average depth	Acre feet	Water level	Extreme fluctuations
190*	27 feet**	8.1 feet*	1,541*	959 MSL	953.0 - 959.5 MSL

Location of benchmark: Along State Road 46 in town of Morris

INLETS

Name	Location	Origin
Several unnamed intermittent inlets enter impoundment along its shoreline		

OUTLETS

Name	Location
Bobs Creek	Below principal spillway in dam

Water level control

Grass emergency spillway around south end of dam. Principal spillway is 5-foot square concrete drop inlet. Ten-inch drawdown tube is present.

POOL	ELEVATION (Feet MSL)	ACRES
TOP OF DAM		
TOP OF FLOOD CONTROL POOL		
NORMAL POOL	959 MSL	190
TOP OF MINIMUM POOL		
STREAMBED		

Bottom type

- [ ] Boulder
- [ ] Gravel
- [ ] Sand
- [X] Silt loam
- [X] Clay loam
- [ ] Marl

Watershed use: Watershed covers approximately 3,000 acres. Approximately 1% is commercial and 4% is residential. The remainder is forest (~10%), agriculture (~38%), and grass/pasture (~41%). (source is http://pasture.ecn.purdue.edu)

Development of shoreline

Public access site with a concrete boat ramp, a courtesy dock, and parking lot is present. Twenty-six residences and some private docks sit along the shoreline. Housing development (Hillindale Commons) and a private boat ramp is located on the north arm of the lake.

Previous surveys and investigations

Hydrographic survey 1963. Fisheries survey 1963. Creel census 1965 and 1966. Evaluation of survey methods 1966. Drained 1966. Restocked 1967. Fisheries survey 1970. Research project 1973-1977. Fisheries survey 1984. Lake enhancement feasibility study 1989-1991. Fisheries survey 1993.

*According to lake enhancement feasibility study. **According to hydrographic survey 1963.

SAMPLING EFFORT					
ELECTROFISHING	Day hours: 0		Night hours: 0.50**		Total hours: 0.50**
TRAP NETS	Number of traps: 2		Number of Lifts: 1 lift per net		Total effort: 2 Lifts
GILL NETS	Number of nets: 4		Number of Lifts: 1 lift per net		Total effort: 4 Lifts
ROTENONE	Gallons: 0	ppm:	Acre Feet Treated:	SHORELINE SEINING	Number of 100 Foot Seine Hauls: none

PHYSICAL AND CHEMICAL CHARACTERISTICS	
Color: gray green	Turbidity: 2 Feet 7 Inches (SECCHI DISK)
Alkalinity (ppm)*: Surface: 103-120 Bottom: 154-171	pH: Surface: 7.8 Bottom: 7.3
Conductivity: 220 micromhos	Air temperature: 84 °F
Water chemistry GPS coordinates: N 39.27450333 W -85.1978863	

TEMPERATURE AND DISSOLVED OXYGEN (D.O.)								
DEPTH (FEET)	Degrees (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)
SURFACE	79	7.31	36			72		
2	79	7.26	38			74		
4	78	6.39	40			76		
6	77	4.31	42			78		
8	76	2.70	44			80		
10	75	1.64	46			82		
12	75	0.84	48			84		
14	72	0.50	50			86		
16	67	0.45	52			88		
18	65	0.40	54			90		
20	60	0.40	56			92		
22	58	0.38	58			94		
24 (bottom)	57	0.37	60			96		
26			62			98		
28			64			100		
30			66					
32			68					
34			70					

COMMENTS
**Electrofisher settings = 884 volts DC, 60 pps, and pulse width = 4 ms (5.2 amps)

*ppm-parts per million

Occurrence and Abundance of Submersed Aquatic Plants in Bischoff Reservoir

Date:	8/11/04	Littoral sites with plants:	30	Species diversity:	0.64
Littoral depth (ft):	4.5	Number of species:	5	Native diversity:	0.53
Littoral sites:	60	Maximum species/site:	3	Rake diversity:	0.60
Total sites:	60	Mean number species/site:	0.77	Native rake diversity:	0.51
Secchi (ft):	2.8	Mean native species/site:	0.37	*Mean rake score:	0.48

Common Name	Site frequency	Relative density	Mean density	Dominance
Eurasian watermilfoil **	38.3	0.67	1.74	13.3
Brittle naiad	20.0	0.32	1.58	6.3
Southern naiad	15.0	0.20	1.33	4.0
Filamentous algae	6.7			
Coontail	1.7	0.02	1.00	0.3
Curly-leaf pondweed **	1.7	0.02	1.00	0.3
Other Observed Plants				
EMERGENT: Buttonbush, Common cattail, Purple loosestrife**, Spikerush sp., Sweetflag				
ROOTED FLOATING: Creeping water primrose				
FREE FLOATING: Duckweed sp.				
SUBMERSED: American pondweed				
** Exotic plants				

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT					
*COMMON NAME OF FISH	NUMBER	PERCENT	LENGTH RANGE (inches)	WEIGHT (pounds)	PERCENT
Bluegill	596	50.4	2.2-8.2	84.69	23.0
Gizzard shad	350	29.6	6.7-13.2	99.02	26.9
Largemouth bass	60	5.1	1.5-19.1	53.33	14.5
Redear sunfish	42	3.6	4.4-8.0	9.34	2.5
White crappie	27	2.3	4.7-12.1	7.12	1.9
Black crappie	26	2.2	5.1-9.0	5.13	1.4
White catfish	20	1.7	9.2-18.0	24.23	6.6
Channel catfish	17	1.4	11.2-19.5	19.71	5.4
Warmouth	14	1.2	2.2-8.2	2.37	0.6
Golden shiner	14	1.2	7.2-8.1	2.35	0.6
Common carp	7	0.6	22.3-33.5	58.72	16.0
Hybrid sunfish	4	0.3	5.7-7.6	0.86	0.2
Black bullhead	3	0.3	5.3-10.1	0.66	0.2
Brook silverside	3	0.3	3.0-3.9	0.02	< 0.1
Totals (13 species & 1 hybrid)	1,183	100.0		367.55	100.0

*Common names of fishes recognized by the American Fisheries Society.

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Bluegill					Bischoff Reservoir			6/14-16/04	
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	EST. AVE. WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0	2	0.3	<0.01	1	20.0				
2.5	21	3.5	0.01	1	20.5				
3.0	26	4.4	0.02	1, 2	21.0				
3.5	4	0.7	0.03	1, 2	21.5				
4.0	19	3.2	0.04	2	22.0				
4.5	47	7.9	0.06	2	22.5				
5.0	47	7.9	0.08	2, 3	23.0				
5.5	69	11.6	0.11	3, 4	23.5				
6.0	130	21.8	0.15	3, 4	24.0				
6.5	147	24.7	0.19	3, 4	24.5				
7.0	66	11.1	0.24	4, 5	25.0				
7.5	15	2.5	0.30	5	25.5				
8.0	3	0.5	0.38	—	26.0				
8.5					TOTAL	596			
9.0									
9.5						PSD = 60/215(100) = 27.9			
10.0									
10.5						Bluegill Fishing Potential Index = 15 (fair)			
11.0									
11.5						%≥ 6 inches = 329/596(100) = 55.2			
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	458.0/hr	GILL NET CATCH	11.5/lift	TRAP NET CATCH	160.5/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Gizzard shad Bischoff Reservoir 6/14-16/04									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5	5	1.4	0.09	1	24.5				
7.0	1	0.3	0.12	1	25.0				
7.5					25.5				
8.0	4	1.1	0.17	2, 3	26.0				
8.5	58	16.6	0.20	2, 3, 4	TOTAL	350			
9.0	123	35.1	0.25	3, 4					
9.5	77	22.0	0.28	3, 4					
10.0	41	11.7	0.34	3, 4					
10.5	16	4.6	0.40	4					
11.0	7	2.0	0.46	4, 5					
11.5	10	2.9	0.51	—					
12.0	4	1.1	0.60	—					
12.5	3	0.9	0.67	—					
13.0	1	0.3	0.79	—					
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	304.0/hr	GILL NET CATCH	49.3/lift	TRAP NET CATCH	0.5/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Largemouth bass Bischoff Reservoir 6/14-16/04									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	EST. AVE. WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	EST. AVE. WEIGHT (pounds)	AGE OF FISH
1.0					19.0	2	3.3	3.74	—
1.5	1	1.7	<0.01	0	19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5	2	3.3	0.04	1	22.5				
5.0	1	1.7	0.05	1	23.0				
5.5	2	3.3	0.07	1	23.5				
6.0	3	5.0	0.10	1	24.0				
6.5	1	1.7	0.12	1	24.5				
7.0					25.0				
7.5	1	1.7	0.19	2	25.5				
8.0	3	5.0	0.24	2	26.0				
8.5	5	8.3	0.28	2	TOTAL	60			
9.0	6	10.0	0.34	2					
9.5	5	8.3	0.41	2, 3		PSD = 21/44(100) = 47.7			
10.0	2	3.3	0.48	3					
10.5	1	1.7	0.57	2		%≥ 14 inches = 12/60(100) = 20.0			
11.0	2	3.3	0.64	3					
11.5	2	3.3	0.74	3					
12.0	3	5.0	0.84	3, 4					
12.5									
13.0	4	6.7	1.09	3, 4					
13.5	4	6.7	1.24	4, 5					
14.0									
14.5	1	1.7	1.59	5					
15.0	1	1.7	1.72	5					
15.5	2	3.3	1.93	6					
16.0	1	1.7	2.06	—					
16.5	2	3.3	2.29	7					
17.0	1	1.7	2.40	7					
17.5	1	1.7	2.90	8					
18.0									
18.5	1	1.7	3.52	—					

ELECTROFISHING CATCH	112.0/hr	GILL NET CATCH	1.0/lift	TRAP NET CATCH	0.0/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Redear sunfish Bischoff Reservoir 6/14-16/04									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	EST. AVE. WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5	1	2.4	0.06	1	22.5				
5.0					23.0				
5.5					23.5				
6.0	8	19.0	0.16	2	24.0				
6.5	17	40.5	0.20	2, 3	24.5				
7.0	11	26.2	0.26	3	25.0				
7.5	3	7.1	0.32	3, 4	25.5				
8.0	2	4.8	0.39	4	26.0				
8.5					TOTAL	42			
9.0									
9.5						%≥ 7 inches = 13/42(100) = 31.0			
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	28.0/hr	GILL NET CATCH	4.0/lift	TRAP NET CATCH	6.0/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: White crappie Bischoff Reservoir 6/14-16/04									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	EST. AVE. WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5	2	7.4	0.04	1	22.5				
5.0	5	18.5	0.06	1	23.0				
5.5	2	7.4	0.08	1	23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5	6	22.2	0.21	3	25.5				
8.0	6	22.2	0.24	3, 4	26.0				
8.5	2	7.4	0.29	4	TOTAL	27			
9.0									
9.5						%≥ 8 inches = 11/27(100) = 40.7			
10.0									
10.5									
11.0	2	7.4	0.72	6					
11.5									
12.0	2	7.4	0.93	6					
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	0.0/hr	GILL NET CATCH	4.5/lift	TRAP NET CATCH	4.5/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Black crappie Bischoff Reservoir 6/14-16/04									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	EST. AVE. WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0	2	7.7	0.05	1	23.0				
5.5	1	3.8	0.08	1	23.5				
6.0					24.0				
6.5	2	7.7	0.14	2	24.5				
7.0	5	19.2	0.17	2	25.0				
7.5	9	34.6	0.20	2, 3	25.5				
8.0	3	11.5	0.24	3	26.0				
8.5	2	7.7	0.30	4	TOTAL	26			
9.0	2	7.7	0.35	4					
9.5						%≥ 8 inches = 4/26(100) = 15.4			
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	0.0/hr	GILL NET CATCH	4.3/lift	TRAP NET CATCH	4.5/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: White catfish Bischoff Reservoir 6/14-16/04									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	20			
9.0	1	5.0	0.33	Not aged					
9.5									
10.0									
10.5	1	5.0	0.54						
11.0									
11.5	1	5.0	0.56						
12.0	3	15.0	0.76						
12.5	3	15.0	0.79						
13.0	1	5.0	0.97						
13.5									
14.0	3	15.0	1.18						
14.5	1	5.0	1.33						
15.0	2	10.0	1.51						
15.5									
16.0	1	5.0	2.04						
16.5	2	10.0	2.22						
17.0									
17.5									
18.0	1	5.0	2.81						
18.5									

ELECTROFISHING CATCH	10.0/hr	GILL NET CATCH	3.5/lift	TRAP NET CATCH	0.5/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Channel catfish Bischoff Reservoir 6/14-16/04									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5	1	5.9	2.46	
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	17			
9.0									
9.5									
10.0									
10.5									
11.0	1	5.9	0.40	Not aged					
11.5									
12.0	4	23.5	0.64						
12.5	1	5.9	0.71						
13.0	3	17.6	0.72						
13.5	1	5.9	0.74						
14.0									
14.5	1	5.9	0.89						
15.0									
15.5									
16.0									
16.5									
17.0	1	5.9	1.70						
17.5	2	11.8	1.89						
18.0	2	11.8	2.16						
18.5									

ELECTROFISHING CATCH	4.0/hr	GILL NET CATCH	3.8/lift	TRAP NET CATCH	0.0/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF: Warmouth				Bischoff Reservoir				6/14-16/04	
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0				Not aged	19.0				
1.5					19.5				
2.0	1	7.1	0.01		20.0				
2.5	1	7.1	0.02		20.5				
3.0	2	14.3	0.03		21.0				
3.5					21.5				
4.0	1	7.1	0.05		22.0				
4.5	1	7.1	0.06		22.5				
5.0	1	7.1	0.09		23.0				
5.5	1	7.1	0.12		23.5				
6.0					24.0				
6.5	1	7.1	0.26		24.5				
7.0	3	21.4	0.27		25.0				
7.5	1	7.1	0.35		25.5				
8.0	1	7.1	0.53		26.0				
8.5					TOTAL	14			
9.0									
9.5									
10.0									
10.5									
11.0									
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	10.0/hr	GILL NET CATCH	2.0/lift	TRAP NET CATCH	0.5/lift

Species Bluegill	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.8	2003	12	2.2-3.6	2.1							
	2002	15	2.8-5.1	1.9	3.4						
	2001	9	5.2-6.7	1.7	3.8	5.2					
	2000	11	5.6-7.2	2.1	3.9	5.3	6.1				
	1999	3	6.9-7.7	1.6	4.1	5.9	6.5	7.1			
	AVERAGE LENGTH			1.9	3.8	5.5	6.3	7.1			
	NUMBER AGED			50	38	23	14	3			

Species Gizzard shad	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.0	2003	4	6.7-6.9	4.4							
	2002	2*	8.2-8.3	4.1	8.1						
	2001	10	7.8-10.0	4.4	7.3	8.8					
	2000	18	8.5-10.9	5.2	7.9	8.9	9.9				
	1999	2*	10.8-11.0	6.3	8.7	9.5	10.2	10.9			
	AVERAGE LENGTH			4.7	7.6	8.8	9.9				
	NUMBER AGED			32	28	28	18				

Species Largemouth bass	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.8	2003	8	4.5-6.3	4.5							
	2002	12	7.7-10.4	4.1	8.2						
	2001	9	9.6-13.0	4.7	8.5	10.4					
	2000	6	12.1-13.5	3.9	7.5	9.9	11.8				
	1999	3	13.7-14.9	4.1	9.9	11.2	12.9	13.7			
	1998	2*	15.3-15.7	4.6	9.0	12.7	13.8	14.8	15.1		
	1997	2*	16.4-16.8	4.6	7.1	8.3	10.1	11.8	13.8	16.0	
	1996	1*	17.4	4.7	7.4	9.1	11.3	13.0	14.5	16.0	17.1
	AVERAGE LENGTH			4.2	8.5	10.5	12.3	13.7			
	NUMBER AGED			38	30	18	9	3			

Species Redear sunfish	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 0.6	2003	1*	4.4	3.1							
	2002	9	5.8-6.6	2.7	5.2						
	2001	7	6.7-7.5	2.3	5.3	6.4					
	2000	2*	7.6-7.9	3.1	6.5	7.0	7.5				
	AVERAGE LENGTH			2.5	5.3	6.4					
	NUMBER AGED			16	16	7					

*Not included in average length calculations.

Species White crappie	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 1.4	2003	5	4.7-5.4	3.6							
	2002	0									
	2001	7	7.4-8.0	3.3	5.8	7.2					
	2000	4	8.2-8.6	3.4	5.7	7.1	8.0				
	1999	0									
	1998	4	11.1-12.1	3.5	5.8	7.2	8.4	9.5	11.1		
	AVERAGE LENGTH			3.5	5.8	7.1	8.2	9.5	11.1		
	NUMBER AGED			20	15	15	8	4	4		

Species Black crappie	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept= 1.4	2003	3	5.1-5.6	3.8							
	2002	7	6.5-7.7	3.5	6.0						
	2001	4	7.3-7.8	3.7	6.2	7.1					
	2000	3	8.4-9.0	3.6	5.9	7.6	8.5				
	AVERAGE LENGTH			3.6	6.1	7.4	8.5				
	NUMBER AGED			17	14	7	3				

Species	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept=											
	AVERAGE LENGTH										
	NUMBER AGED										

Species	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE							
				1	2	3	4	5	6	7	8
Intercept=											
	AVERAGE LENGTH										
	NUMBER AGED										

*Not included in average length calculations.

GPS LOCATION OF SAMPLING EQUIPMENT

GILL NETS			TRAP NETS			ELECTROFISHING		
1	N 39.28292	W -85.18618	1	N 39.27709	W -85.19599	1	N 39.27486	W -85.19950
	N 39.28303	W -85.18540	2	N 39.27410	W -85.19255		N 39.27413	W -85.19520
2	N 39.28338	W -85.18786	3	N	W	2	N 39.27068	W -85.18974
	N 39.28397	W -85.18785	4	N	W		N 39.26867	W -85.18714
3	N 39.28057	W -85.19114	5	N	W	3	N	W
	N 39.27972	W -85.19044	6	N	W		N	W
4	N 39.27758	W -85.19915	7	N	W	4	N	W
	N 39.27799	W -85.19960	8	N	W		N	W
5	N	W	9	N	W	5	N	W
	N	W	10	N	W		N	W
6	N	W	11	N	W	6	N	W
	N	W	12	N	W		N	W
7	N	W	13	N	W	7	N	W
	N	W	14	N	W		N	W
8	N	W	15	N	W	8	N	W
	N	W	16	N	W		N	W
9	N	W	17	N	W	9	N	W
	N	W	18	N	W		N	W
10	N	W	19	N	W	10	N	W
	N	W	20	N	W		N	W
11	N	W				11	N	W
	N	W					N	W
12	N	W				12	N	W
	N	W					N	W
13	N	W				13	N	W
	N	W					N	W
14	N	W				14	N	W
	N	W					N	W
15	N	W				15	N	W
	N	W					N	W
16	N	W				16	N	W
	N	W					N	W
17	N	W				17	N	W
	N	W					N	W
18	N	W				18	N	W
	N	W					N	W
19	N	W				19	N	W
	N	W					N	W
20	N	W				20	N	W
	N	W					N	W